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apprenticeship. A boy who becomes interested in the trade will hang about the smith's workshop, blowing the bellows for him and doing other minor tasks. Finally he will be allowed to help with the forging and may accompany the smith on his travels. When he thinks that he knows the trade, he will set up in business for himself. No regular payment is made to the teacher, but if the new smith prospers, it is customary for him to visit his former master, thank him publicly, and present him with an ox. 326

Every smith has a house and land in some particular village and spends most of his time there. During the slack season between harvest and the next planting, the smiths travel about repairing old implements and forging new ones. When a man is in need of the smith's services, he first bargains with him, then, when the price has been fixed, takes him into his house and feeds him until the task is completed. Smiths seem to be much more numerous among the Ikongo than among the Menabe.

The stonecutters are mostly Betsileo living among the Tanala. They go where their services are required and are similarly boarded during the work. 324

As far as I could learn, there are no ceremonial observances or taboos connected with any industry. There seem to be no charms to give success in occupations, with the possible exception of house building, although I was unable to get a satisfactory check on this for metal working. 777

METAL WORKING

According to Tanala traditions, the aborigines of their territory were ignorant of the use of metal, but the ancestors of all the invading gentes were familiar with iron at the time they entered the region. The next metal to become known to them was silver. There are no known deposits of silver ore in Madagascar and the metal was certainly obtained from Arabs or Europeans. Nevertheless, the Tanala have no legends of its introduction. It has been thoroughly incorporated into the culture, figuring in the invocations to the gods and in a number of rites and ceremonies. In general, it seems to occupy the place that gold occupies among the tribes of the plateau and west coast. 325 135 [439]

Gold, in the form of dust or small nuggets, is found throughout much of the Tanala territory, but the Tanala themselves make no use of it and seem to have no beliefs in regard to it. It does not figure in any ceremony, and is mentioned in only one or two invocations.

325 135 It seems probable that the Tanala were ignorant of its value, if not of its existence, until they were instructed by foreign traders. A few abandoned gold workings have been found by prospectors, and one or two caches of gold dust, but there is no way of determining their age.

325 439 Copper is still almost unknown, the only objects in use being a few bracelets obtained from the Betsileo. Brass, in the form of ornamental knife hilts and bracelets, is used by the Ikongo. They do not manufacture these articles, but buy them from the Bara, who are clever brass casters. The metal itself is of European origin and most of the knife hilts are made from old cartridge shells melted down.

135 326 438 The most important iron deposits are in the territory of the Tanala Ikongo. There are also deposits in the territory of the Zafimaniry, among the Menabe. There are a great number of smiths in this gens and they formerly carried on a regular trade in metal and finished implements with their neighbors. No account of Ikongo iron working was obtained, but their methods probably are the same as those of the Zafimaniry.

325 The ore used by the Zafimaniry is hematite, with a rich iron content. It occurs in the soil in the form of small pebbles and is simply washed preparatory to smelting. If the pieces are more than ¾ inch in diameter, they are broken up with hammers. The furnace is of the simplest sort (Fig. 10, c). A hole 2 to 2½ feet across and 18 inches to 2 feet deep is dug in the hard clay soil, with a sloping groove or trench entering it from one side, to accommodate a pipe leading to a bellows. The air pipe enters the pit 3 to 4 inches above the bottom. Sometimes a rim of clay 3 to 4 inches high is built around the furnace.

The smelting is done with charcoal, made by the ordinary European method. A layer of ignited charcoal is put in the bottom of the pit, then a layer of ore, then more charcoal and more ore until the furnace is filled. Two men work the bellows in shifts, keeping up a steady draft, and more charcoal is added as the mass burns down. The smelting requires about five hours. The molten iron collects in the bottom of the pit forming an ingot called sovomby. This is drawn out and hammered as soon as it solidifies. Because of the small size of the furnace only a little iron can be smelted at a time. The metal is soft and malleable and the native smiths say that it is much easier to work than European iron.

The bellows employed in smelting and forging is typically Malayan (Fig. 10, a). It consists of two wooden cylinders from

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FIG. 10. Iron and Wood Working Tools. a, Fierce Bellows; b, Details of Fierce Head; c, Furnace (or Iron Smelting); d, Axe, Ancient Type; e, Axe, Recently Introduced from Betsileo; f, Chisel; g, Small Gouge; h, Whetstone in Sheath; j, Carver's Gouge.

325 3 to 5 feet long with a bore of about 6 inches. The bore is much more constant than the length and rarely varies more than an inch. In each cylinder there is a piston with a long handle of light wood or bamboo and a round, lat wooden head only slightly smaller than the bore. A ring of cloth about an inch thick is loosely attached to the lower side of the head by means of cords passed through holes drilled around its rim (Fig. 10, b). On the up stroke the cloth ring falls away from the head, allowing the air to enter. On the down stroke the friction of the cylinder wall forces the ring upward against the head, closing the apertures and compressing the air below. In the side of each cylinder, at the bottom, there is a hole about an inch in diameter. A bamboo pipe 2 to 3 feet long is fitted into this and the joint sealed with cow dung. The two cylinders are cleated together in such a way that the bamboo pipes converge, forming a V. The apex of the V is inserted in a short conical tube of burned clay or soapstone, which conducts the air into the fire. The operator works the two pistons alternately, keeping up a steady draught.

325 All iron implements are forged, casting being unknown. The
417 metal from broken and worn-out tools is welded into bars and then worked up into new implements. The smiths' tools consist of two or three hammers of different sizes, an anvil, chisels, files, wooden tongs and a roughly hollowed trough of wood or stone to hold the water for tempering. The hammers are of iron with wooden handles and are shaped much like the European ones. One side of the head usually tapers to a sharp edge, used for cutting the hot metal. The anvil is also of iron, with a flat top not more than 3 inches square and a long wedge-shaped or pointed bottom. The lower part is sunk in the ground or driven into a log and the smith always squats at his work. The chisels are shaped like European cold chisels. All the files seen were of European manufacture and I suspect that this tool is an innovation. Perhaps pieces of rough sandstone were originally used. Tongs are made from sticks of green wood 1½ to 2 inches in diameter and 3 to 5 feet long. The end of the stick is split back for 18 inches to 2 feet and it is then wrapped with withes or vines immediately above the split. Sometimes a loop of tough, green vine is used instead. This is slipped over the iron and the ends twisted about each other.

375 Tanala iron work is comparatively poor. Even their best imple-
ments are roughly finished. Their axes and knives are poorly tempered and require constant sharpening. Iron meat hooks and toasting forks are sometimes decorated by twisting the handles while

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the metal is hot. Some knife and meat hook handles terminate in spiral antennae (Figs. 1, f; 5, g). Iron is never inlaid with other metals. 325 (531)

There are very few Tanala silversmiths, most of their ornaments being bought from the Betsileo. The ornaments are usually made from French five franc pieces and, at the time of my visit, the government had prohibited silver working as part of a campaign to introduce paper money. Because of this, the silversmiths carried on their work surreptitiously and I could learn nothing of their methods. 326 177

WOOD WORKING

With the exception of the Zafimaniry gens, the Tanala are rather inferior wood workers. Their tools consist of the axe, chisel, knife, plane, drill, and two types of gouge. Adzes are unknown and saws were unknown until introduced by Europeans. They are still rarely used. 322 412

The axe (*antsi*) is used both as a tool and as a weapon. All native men carry one when traveling. The blade is shaped like that of an American cleaver, flat, with a square end and a straight or slightly curved cutting edge 4 to 6 inches long (Fig. 10, d). It has a straight, horizontal tang about 3 inches long which is inserted in a straight wooden handle 18 inches to 2 feet long and about 1 inch in diameter. In mounting the blade the tang is heated red hot and used to burn a hole of the proper size in the end of the handle. When this is deep enough the tang is fixed in it with a strong vegetable cement, made from a berry. The handle is then reinforced about the tang with a metal ferrule or a band of rawhide taken from a cow's tail and slipped on wet.

Chisels are of solid iron and are shaped much like our own cold chisels. They are used for fine work in hollowing wooden utensils and in dressing joints in timbers (Fig. 10, f).

Planes are shaped much like the small planes used by our own carpenters (Fig. 11, f). The plane-iron tapers to a point, which is usually recurved. It is held in place by a wooden wedge. The Zafimaniry often use plane-irons with a fluted edge (Fig. 11, e), producing a corrugated surface. Planes are used for dressing house timbers and the outside of large wooden utensils, especially boxes.

Drills are identical with those already described under Fire Making except that they are fitted with chisel-shaped iron bits. They are rarely used in wood working, small perforations usually being made with a hot iron.